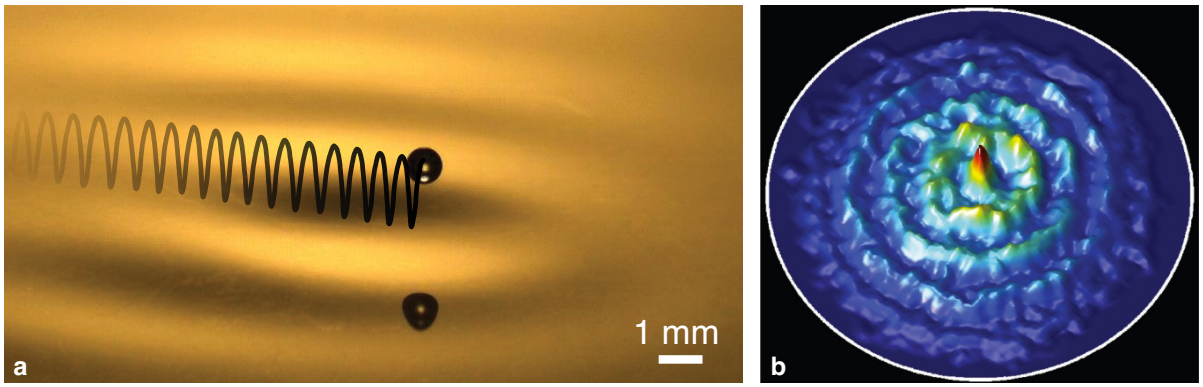
Titolo: Macroscopic quantum analogs

Proponente: Giuseppe Pucci (giuseppe.pucci@cnr.it)

Tipologia: ciclo di seminari + approfondimento mediante studio personale

Descrizione: About fifteen years ago, Yves Couder, Emmanuel Fort and collaborators in Paris discovered that a droplet may "walk" by virtue of a resonant interaction with the wavefield that it generates by bouncing on the surface of a vibrating liquid bath. This walker is a classical system that couples a particle and a wave at the macroscopic scale and exhibits a number of quantum-like behaviors. I will present the quantum analogs observed in experiments and with models inspired by the walker system in order to systematically approach the following question: to what extent can a classical wave-driven system reproduce phenomena that are thought to be peculiar to the quantum realm?

Lectures include the following quantum analogs with walkers (non-exhaustive list): tunnelling, level splitting, quantization of orbits and angular momentum, wavelike statistics in cavities, Friedel-like oscillations, diffraction and interference.



(a) Oblique view of a walking droplet (picture from J. Bush's group at MIT).
(b) Long-term statistical distribution of the droplet position in a circular cavity (D. M. Harris *et al. Phys. Rev. E* 88:011001(R), 2013).

References

Y. Couder, S. Protière, E. Fort, and A. Boudaoud, Walking and Orbiting Droplets, Nature 437, 208 (2005).
J. W. M. Bush and A. U. Oza. Hydrodynamic quantum analogs. Rep. Prog. Phys. 84, 017001 (2020) and references therewith.

Impegno orario stimato: 25.

Destinatari/e: III anno triennale, II anno magistrale.

Modalità di verifica: da concordare con gli studenti.